Remarkably enough the valley of the Upper Angara, which 133
stretches far to the east between glaciated mountain ranges (Upper Angara Range in the north, the Barguzin Range in the south) was not exposed to glaciation.

Also south of Lake Baykal the mountain ranges had glaciers, which in the valley of the Slyudyanka and Pokhabikha reached the level of Lake Baykal in the form of valley glaciers. Here more than 25 glaciers have been counted in an area of 60 square kilometers, but these were all only insignificant ones which at most had a length of 10 kilometers. The landscape is rich in gorges, which lie at very different heights ranging from 50 meters to 600 meters above the present level of Lake Baykal (454 meters above sea level). Thus the Ice Age snow boundary must have been very low here in comparison with the neighboring Sayan (around 2,000 meters) and the northeastern Baykal area (at least 1,200 meters). An explanation for this striking appearance can be seen in the fact that Lake Baykal itself even in the Ice Age /51/ exerted an influence on the climate of the surrounding areas, an influence which was especially noticeable here in the southern part where even today the rainfall is high. The slope of the Khamar-Daban turned toward Lake Baykal is the rainiest area in Transbaykal. But in addition there is the fact that southern Lake Baykal is an area of recent depression, which continues even today, and accordingly the traces of the glaciers can also be regarded as subsequently dislocated.

There are also local glaciations in Transbaykal apart from the above-described glaciated areas. The best known are the glaciations of the 2,500 meter high Sokhondo and neighboring mountains, where gorges, trough valleys, and even moraines appear on the slopes.

Traces of an old glaciation have also been found in the Dzhugdzhur, in the Stanovoy, which extends up to 2,482 meters in height, in the Tukuringra Range in the heights on both sides of the Zeya break-through, and in the Yam-Alin (2,215 meters). However, the signs are but slight throughout and appear only in a limited area, and accordingly here there were at most individual dotted glacier formations.

The Permafrost and Its Significance

The largest part of the Soviet Russian Far Eastern region lies 137 134
in the sphere of the permafrost or the Eternally Frozen Earth, as this

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134 appearance of nature is also named, and this therefore deserves special treatment within this work. The Soviet government has specially undertaken research on this phenomenon, which is typical of the largest part of Siberia and also for parts of the European north; the government has erected eight permanent research stations for this purpose, of which four are in the regions being discussed: namely, in Petrovsk (Transbaykal), Skovorodino on the railroad line north of the northern arc of the Amur, Bomnak in the trough depression of the upper Zeya, and in Anadyr'. In addition to B. Shostakovich, M. Sumgin especially has done great service in research on permafrost. Orientation on the extent of the permafrost is given in the attached sketch map, which is based on Russian sources. This map shows that the only areas completely free from frozen ground are the areas on both sides of and between the Zeya and Bureya rivers and perhaps the area east of the Bureya Mountain Range, including the entire Ussuri country and the Maritime Krai. Frozen earth is not found in the larger southern part of Kamchatka and on Sakhalin Island either.

[654]

In the areas which are dominated by permafrost, the ground thaws in the summertime only superficially in a layer whose thickness varies considerably with the locale, and under this layer lies the permafrost, i.e. a constantly frozen layer of earth, which likewise is of varying thickness. The upper layer which thaws in the summer, is called "active" (deiatel'nyi sloi) /52/ by the Russians, and only it is the bearer of organic life. In the majority of cases the pieces of earth in the permafrost area are so strongly cemented together by ice that the ground gives way only under the blows of a crowbar. However, this sign of linking together by ice must not be used as the sole means of determining whether the ground should be classed as eternally frozen; rather this classification depends above all on the temperature. Thick rock can also bear permafrost, although no external changes can be discovered on the rock.

In the winter the ground freezes from the surface down. In many cases, then, the winter freeze and the permafrost grow together into one unit, but in most cases there remains between the two an unfrozen horizon, whose water under special morphological conditions, especially at the foot of slopes, breaks through the upper frozen layer or is pressed out by the pressure from above of the frozen earth. This leads to formations of ice on top of the ice (Naled'), which, since the water flowing out freezes again and again, can often extend over a large area and can attain a thickness of more than one, indeed of two meters.

1 [i.e. permafrost -- Analyst]

Or, under specific conditions, ice kernels form within the earth. 132 134. These ice kernels grow and press the upper layers of the earth into a hill, which then in the warm season collapses again. As a result a lake is frequently formed in place of the hill because of break-throughs in the earth. Generally the existence of frozen earth permits the absorption of the surface water only to a certain depth, and accordingly the rainfall for the most part must flow off on the surface. The irregular water flow of the rivers in these regions often goes back to this phenomenon. Thus the contrast between the high and low water lines is very great everywhere. At the confluence of the Shilka and the Agrun, the Amur passes, as its annual mean 1,200 cubic meters of water per second, while the minimum during the year is only 125 cubic meters per second. Heavier rainfall makes itself felt immediately in an often flood-like rise in the water being passed in the rivers. The thawing of the surface layers of the earth, especially in areas with varying morphological formations, offers the best conditions for ground flows. Thus the domain of the permafrost is the classical land for landslides and solifuction.

But, in addition to these numerous and very interesting natural 132 phenomena, the effects of the permafrost on man and his economy 134 must be mentioned; these effects are apparent everywhere in the per- 499 mafrost domain and often bring difficulties. Through freezing the volume of the water expands, presses the ground upward in places, and causes destruction of transportation installations. Deep tears occur in the railroad line, and through these tears mud and water from deeper layers often push out, /53/ /Mapof the permafrost area:/ /54/ freezes on the surface, bursts the splits open farther, and forms high bucklings, and thus gradually the roads become unusable. With the setting in of the thawing weather, everything sinks together in mud and pulp.

In addition the roads and especially the bridges are by preference the starting points for ice building on ice. As an example [491] Sumgin points out the road built from Bol'shoy Never on the Amur railroad, via Tyndinskiy and the Aldan gold region, to Yakutsk on the Lena. This road should be usable for trucks the entire year. Out of the entire length of 1,300 kilometer, on the southern part alone between Bol'shoy Never and Tommot, which is 728 kilometers long, 117 formations of ice on top of ice were counted in the winter of 1927-28. These formations caused serious destruction, especially on bridges which were as a result partially raised up, made crooked, and gradually

Map of the Permafrost Area: /53/

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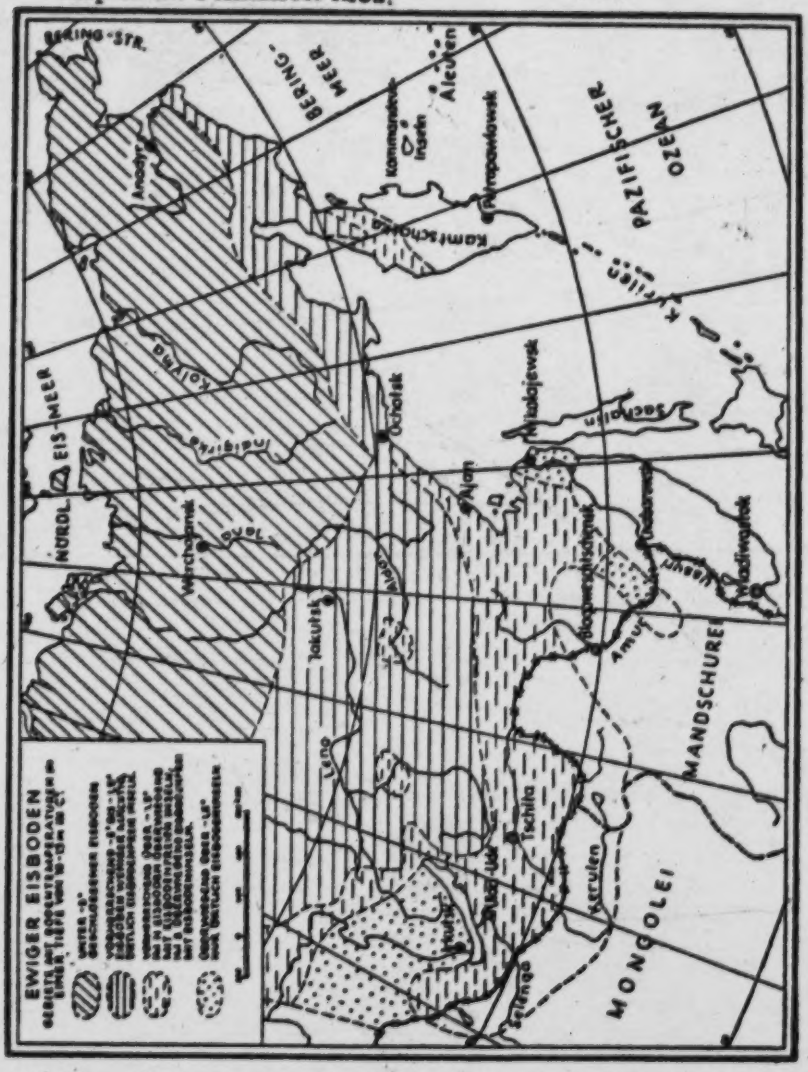
134.



Areas with Ground Temperatures in Celcius Degrees at a Depth of 10-15 Meters:

Under - 5°
Closed-off area of frozen ground.

Predominantly - 5° to - 1.5°
Frozen earth less thick
Islands here and there where the ground is not frozen.

(Captions continued on following page)

/53/

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Predominantly over - 1.5°

In the north predominantly frozen earth with islands where the ground is not frozen. In the south for the most part the ground is not frozen butthere are islands where it is.

Predominantly over - 1.5°

Only in places are there islands where the ground is frozen

132 134 479 made unusable. In the spring after the melting away of the ice, the bridges completely collapse. The population claims that earlier formations of ice on ice occurred only seldom in these same regions. Thus it must be assumed, and Sumgin also points this out, that the formations of ice on ice are encouraged by the building of roads. Through trials and experience, various new methods of road-building have been found which hinder this damage, but it can not be entirely eliminated. In general terms it can be said that in the areas of permafrost road-building is very difficult, requires a longer time, and is done at much greater cost than in other regions.

Of a similar type are the difficulties encountered in building and maintaining railroad lines. In addition to the pulsation of the earth, landslides and solifluction are regarded as being especially dangerous here. In building the Amur railroad line all these hindrances and difficulties became known in detail. Often, without regard to the cost, the lines had to be laid entirely differently from what had originally been planned. Especial difficulty was encountered in providing water for the railroad in the winter in the areas of permafrost. Water had to be drilled from layers which lay under the permafrost. In many places water had to be procured in kilometer-long, heated conduits. A comparison of costs shows best how great the difficulties were in building the Amur railroad line in the areas of permafrost and to what extent these difficulties increased the costs here versus those in other regions. The building of the great Siberian Railroad (as far as Sretensk in Transbaykal), including all preparatory work, required as a mean an expenditure of 67,737 rubles per verst, while the western part of the Amur line from Kuenga to Kerak, whose total lenght is 597 verst, required for pure building costs an average expenditure of 158,000 rubles per verst. Also the maintenance of the railroads requires larger outlays, since the railroad lines, and especially the bridges, require constant and very careful inspection, in order to be able to take /55/ protective measures in time at the slightest sign of any destruction whatsoever. Thus in the course of the year position changes were determined on 50 out of a total of 80 bridges on the Amur railroad, and these position changes had to be eliminated by protection and rebuilding measures.

132 134 342 The permafrost also plays a noteworthy role in the method of construction. Apart from the direct effects of the cold, the buildings in the sphere of the permafrost are subjected to the danger of gradual decay. The reason for this lies principally in the fact that the ground

under a building freezes little if at all during the winter. V.G. Petrov (154) writes on this subject: "The house stands as though on

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154. Petrov, V.G. Naledi na Amursko-Iakutskoi magistrali /Formations Breaking Through the Ice (Aufeisbildungen) in the Amur-Yakutsk Magistracy/. Academy of Science, Moscow, 1930.

the edge of a frozen crust. If now this crust begins to thaw, its edge spreads the house lengthwise and widthwise, and the damage begins." This leads to general deformation of the house and to the gradually sinking in of the house into the ground. Sumgin points out that this danger is caused above all by so-called "swimming" masses, which form under the house and which can be traced back to the changes in the thermic conditions in the ground. With larger structures of several stories, they can often be caused by the pressure of the structure alone. In individual cases it happens that the water in the earth, which lies between the winter freeze and the permafrost and which is under a certain pressure, finds a way into the open underneath the house. It penetrates into the cellar and even into the living quarters and forces the occupants to leave the house. Not uncommonly the penetration of the water occurs so quickly that the occupants do not succeed in rescuing all their possessions from the rooms. The regions of permafrost require construction methods which counteract these dangers. As a rule an attempt is made to lay the foundation so deeply that it has a firm position in the permafrost; to do this, mostly wood or reinforced concrete palings are inserted into prepared holes deep in the permafrost. In the construction of new cities and plants the question of a sufficient and secure foundation plays an important role, and it also is an important factor in the cost estimate. In building the city of Magadan, where apartment buildings with up to six stories were erected, thick layers of earth had to be removed in order to install the foundations so that the foundations became frozen fast into the ground. The sides of the foundations were protected by insulating layers. Often the foundations were entirely embedded in insulating layers here. In order to eliminate all these difficulties, M.M. Kryllov, whom Sumgin cites, had drawn up a plan to be carried out with the help of modern cold technology; this plan envisaged keeping the ground within the construction installations always under a certain temperature with the goal either of preserving the permafrost at a certain depth or even of raising it. However, this proposal has been tried out but little in practice.

000 even of raising it. However, this proposal has been tried out but little in practice.

132 /56/ In addition to the general water supply, the supplying
● 134 of drinking water in the permafrost regions in winter causes many
312 difficulties, especially for larger settlements. Since many rivers freeze to the ground, the water must often be gotten from far away. In many places artificially caused formations of ice on top of ice are used to help in smaller settlements. But it would lead us too far astray to go into detail here on the various and often also unique methods of procuring water.

132 The permafrost is also of great importance in connection with
134 mining and with the extractions of natural resources generally. In
316 pit mining the permafrost sets great hardness against the invasion of man. Even diamond drills fail sometimes, and, if the motor stops for even a moment, the drill freezes fast in the water of the hole being drilled. The pits and galleries are mostly firm and hold even without supporting beams, the danger of chokedamp is slight, and also ground water seldom appears, and only occasionally do water break-ins occur. In open mining the permafrost must be dynamited, but then the blocks knocked loose turn into bulky pulp. Gold extraction has to overcome special difficulties in the working of gold wash-works which mostly are in the permafrost and lie under a thick, unfrozen layer of earth which can be removed rather easily. In the most important gold regions the most modern machinery is employed to process the gold-bearing sand in one vein with everything from dredge to dressing-floor, but all these technically complete establishments conduct a difficult battle with the permafrost, whose hardness gives extraordinary resistance. The natural thawing under the air temperature of the summer proceeds so slowly that man must help it along. The primitive thawing with the aid of wood and coal fires has disappeared, and jets of water also do not suffice here. At present, steam is employed everywhere, and new announcements report that the use of electricity is being considered for the future.

132 The role played by permafrost in connection with vegetation
134 is many sided, but the mutual relationships are still too little clarified. For the agrarian economy the permafrost is a more favorable factor as a source of ground dampness, especially in the interior which suffers from a shortage of summer rainfall. Here the dampness of the ground is a natural compensation. It is due to the exploitation of these favorable conditions that Soviet Russia has succeeded in spreading agriculture,

if not in large areas, yet sporadically toward the Polar Circle, where cultivated areas are to be found to a greater or lesser extent near all settlements as far as north of Magadan. These cultivated areas serve as a source of local supply. 132 134

/57/ The Climatic Conditions

The climatic conditions are determined by the seasonally changing contrast of the barischen /baric?/ relationship between continent and ocean. In winter dry air masses flow toward the ocean; the summer sea wind on the other hand brings dampness into the land. Accordingly the influence of the ocean is limited to the true Far Eastern regions whose waters empty into the Pacific. These regions accordingly form a climatic unit. As a consequence of the regular seasonal climate changes, these regions belong to the East Asiatic monsoon area, whose typical character is clearly stamped everywhere and has its effect as far north as beyond 60° latitude. Only Transbaykal lies outside of this unit. Its inland location allows the continental traits to appear much more sharply. But the summer monsoon also makes itself felt here as far as the Yablonovyy Mountain Range. 132

The following climate areas in addition to Transbaykal can be differentiated according to their general character: the Amur-Ussuri area, the southern coastal region, in which Sakhalin is also included, the northern coastal region including Kamchatka Peninsula, and the Anadyr' region. The important distinguishing features are included in the following chart:

Area	Annual Rainfall in millimeters	Number of months with a mean over		Annual Temperature Variation
		5°	10°	
Transbaykal	200 - 340	5	3	42° - 52°
Amur-Ussuri Region	525 - 620	5	5	42° - 48°
Southern Coast	540 - 760	6	4	30° - 34°
Sakhalin	500 - 750	5	4	28° - 35°
Northern Coast	300 - 900	4	2	33° - 37°
Kamchatka	500 -1,000	4	2	23° - 32°
Anadyr'	190 - 200	3	3	40° - 45°

Transbaykal has very slight rainfall and great temperature

241 Chinese. This method of cultivation, of course, demands more work, and the Russian clinging to his customary methods naturally struggles against it. With the beginning of collectivization the kolkhoz have employed specially constructed sowing machines which take these special conditions into account.

North of the Amur region the natural conditions for agriculture become more unfavorable. The reason for this, however, does not lie in the increasing coldness of the winter but rather above all in the shortening of the vegetation period. These regions, therefore, de-
[242] pend on cultivated plants which ripen quickly. In this connection the Soviet Union has attained successes worthy of recognition in the development of types which ripen quickly and in the use of special methods of preparing seeding (Yarovisation). The Soviet Union has succeeded in moving significantly farther to the north the outer limits for grain cultivation.

• 134 The earth in Transbaykal in the areas preponderantly covered by forests belongs predominantly to the podsol type; numerous varieties of earth have been formed which sometimes approach loamy soil, sometimes sandy soil, according to the clay content. In the river valleys marshy and semi-marshy soil is widely diffused. The vegetable mold content of the podsol soil is only slight, being 2 percent to 3 percent; in marshy soil, however, it is large, being 15 to 30 percent. In the forest steppe areas and in the steppes of Transbaykal the soil is relatively rich in vegetable mold. East of the Yablonovyy Ridge typical black earth has even developed as far as the Argum. Interesting is the fact that the various slopes of the same ridge often show a different soil profile which corresponds with the plant growth. The north and northwest slope is covered with taiga, under which typical podsol soils lie, while on the east and southeast slopes, which are taken up by loose collections of birches, there is little or hardly any podsol; indeed, according to its external signs it already passes over here into the dark chernozem type. In the Amur and Ussuri country podsol and marshy soils with all their transitional forms take up the greatest part of the land. The soil of the Zeya-Bureya lowland and of the Ussuri-Khanka depression--the principal agricultural areas--consists essentially of young, fruitful alluvial deposits. The dark color of the upper layer of soil, rich in vegetable mold, misleads one into designating it as chernozem, black earth, but in reality it is semi-marshy meadow soil with thick layers of vegetable mold. In the dry spots this soils does in fact recall the black earth in its physical

characteristics and its structure, but in lower, damp places it clearly shows its semi-marshy origin. 134

In general, however, podsol soil predominates here; it is but a little inferior in quality to the same soils of North Germany and Central Russia, and it is well suited for agriculture. According to general /127/ estimates, the area capable of cultivation is 200,000 square kilometers in Transbaykal, 110,000 square kilometers in the Amur county, and 150,000 square kilometers in the Ussuri region--thus a total of 460,000 square kilometers. In contrast to these opportunities, the area exploited thus far for agriculture was only 1,877,900 hectares (1938) and thus only a small proportion of the total area available. However, the area under cultivation has increased 60 percent since 1913, when it was 1,171,500 hectares; and this is a mighty accomplishment for this land so distant from central Russia. 311

The growth of the area under cultivation occurred differently in the various regions as the following chart shows. The area under cultivation has more than doubled since 1913 in the Buryat Mongol ASSR and in the Chita Oblast, and this increase has been continuous in the years of the Soviet regime. The natural conditions here are similar to those of the southern Russian steppe, and require no special adaptation on the part of the Russian peasants. Conditions are different in Khabarovsk Krai and in the Maritime Krai, as has already been shown. The cultivation of new areas here is behind that in Transbaykal and shows greater variations from year to year. The decline in Khabarovsk Krai from 740,300 hectares in 1928 to 580,800 hectares goes back to the beginning of the Five Year Plans which eliminated less productive land by means of planned management. It is remarkable, however, --as official Soviet statistics indicate--that there has been a regular year by year decrease in the area under cultivation in the Maritime Krai from 1932 to 1938. (The figures from 1932 to 1938 in 1,000 hectares are: 461.8--449.6--431.6--419.9--371.0--322.0--322.0--318.3.)

The above as well as the following figures are taken from the Soviet publication, "Posevnye ploshchadi SSSR" (11).

11. "Posevnye ploshchadi SSSR" /Areas under Cultivation in the USSR/. The Dynamics of 1928, 1932-38 in Comparison with 1913. Statistical Reference Work. Issued by the State Planning Commission, Moscow-Leningrad, 1939.

Both types of steppes[1] have developed on chestnut-colored 133
soil. Within these steppes salt-pans also appear. Further toward the 137
north the soil becomes darker, its humus content becomes greater (3 per- [134]
cent to 5 percent), it changes into the so-called southern black earth, which has only a slight thickness and has a carbonate layer lying near it. The plant growth becomes richer, the contiguousness of the vegetation covering becomes thicker. These are pronounced grazing areas for sheep and goats. For large livestock they are still not sufficient. For such livestock only the meadow steppes can be considered; these meadow steppes often cover large areas along the rivers. To this category belong the Selenga steppes and the valleys of the Dzhida and the Uda. A similar change in the character of the steppes takes place in the direction of the individual mountain chains, with the various types of steppes surrounding the mountain ranges in Isohypsen /isohyetal?/ contours.

The principal importance of the Selenga steppes lies in livestock 231
breeding, which is intensified by the breeding of valuable breeds. The most important regions here are the areas left of the Selenga and the already mentioned valley of the Dzhida. The old yurts of the Buryat 242
have disappeared, and in their place small, permanent, modest wood houses have appeared which in long rows surround the kolkhoz buildings of the concentrated livestock economy. However, in the less favorable grazing areas, as in the Kundara steppe east of Kyakhta, the old Buryat life has been retained. For processing the resulting skins, a rather large 282
leather processing plant has been erected here on the middle Chikoy under the name of Chikoyskiy Zavod. This plant also draws its raw materials from Mongolia. The cultivation of grain is more in the fore- 241
ground in the other regions on the right side of the Selenga, especially on the lower courses of the Chikoy and the Khilok.

The broad steppe valley of the Uda is the second most important 231
animal breeding area in the Buryat-Mongol ASSR, especially since here numerous Russians have been drawn into animal breeding. In the area 361
around the upper course of the Uda, in the region of the Yeravninsk plain, which is rich in lakes, numerous Russian villages have come into [234]
being in which, in addition to slight agriculture, excellent dairy farming is pursued. The largest localities in this region are Gunda and Sosnovo-Ozerskoye.

East of the Selenga, rising from its delta, is the mountain ridge 133
of the Ulan-Burgassy, which forms the watershed between the Uda and the Turka, which empties into Lake Baykal. This mountain range is broader than the Khamar-Daban and has a marked plateau-like surface

[1] [i.e. artemisian and meadow steppes -- Analyst]

133 Side erosion predominates. Gradually the ridges dissolve into hills. This landscape, designated by Presnyakov as the Gobi type, takes up the entire southern part of the Argun region. Here are the mountain steppes of the Onon and Argun. The Tarey Basin, which is also designated as Onon plain by Russian geographers, should be named as the third province. The Tarey forms a basin with no outlets and extends beyond the Mongolian border as far as the Kerulen. In the center lie the Tarey lakes, of which various ones cover a significant area. Thus the Barun Tarey covers 435 square kilometers, and the Sun Tarey covers 300 square kilometers. The countryside is for the most part level and is interrupted only by former river valleys and lake basins which are now dry. The /228/ remaining lakes lie 60 to 70 meters below the general surface, i.e. at an absolute height of 620 meters, but they are always still up to 5 meters deep. Despite the clear signs of recent drying up, water springs appear in many places on the surface. These springs form the centers of human life. The steppe character often gives way already here to wasteland forms.

The border between steppe and forest extends from Aksha on the middle Onon via Il'inskaya to the north to the watershed between Aga and Ingoda, then on the Ingoda to the east to the mouth of the Aga. From here the border circumscribes the Argun mountain country in an arc swinging to the south via the localities of Onon-Borzya, Akatuy, and Algachi. The border then turns again toward the northeast via Nerchinskiy-Zavod to the Argun.

Southeast of Chita there begins the Aginsk steppe, a true grass steppe, which takes up the river area of the Aga and the middle Onon. [231] Here lies the national oblast of the Buryat, who have made the area into an important livestock-breeding region. The Argun steppe takes up the entire southeast, where livestock breeding likewise dominates the economy. But here there are Russians, who pursue the breeding of cattle and sheep in large, specialized, state farms. In addition, [241] there are also some state farms for horse breeding. To the north of both steppes agriculture, with wheat as the main product, is diffused over a large area, and in a broad front it penetrates to the south. [361] Along the great rivers and also along the Argun the villages extend in a line through the middle of the steppe. The diffusion of agriculture ●[134] is favored by the circumstance that, despite the often very poor steppe vegetation, a horizon very rich in humus, a type of black earth, has developed under the pitted grass /Grasnarbe/.

ooo The wealth of natural resources is, however, of far greater

Range, which here goes up to the Amur. Toward the north the plain 133
extends into the river area of the Selemdzha as far as the spurs of the Tukuringra Mountain Range. Vast plains, formed by Tertiary fresh water deposits, warm, damp summers, extensive agriculture, a heavy population, numerous villages and little cities--all these are the main distinguishing marks of this region.

The southern part along the lower courses of the rivers is almost completely level and is often covered with old waters, swamps, and lakes. But even here dry islands rise in long, flat waves in the areas between the rivers. Morphologically, however, these dry islands are scarcely striking in the plains which generally predominate. Instead, something of a change in the vast monotony is brought by the paths of the rivers, all of which have a marked steep right bank which though not high, is still heavily gorged. The left meadow shore, which mostly is covered with swamps, then rises gradually to the watershed areas. The Bureya continues to show this asymmetrical shore formation even far into the mountain country. North of the Tom', a left tributary of the Zeya, the relief changes. It becomes rolling, hilly, and rises gradually toward the north. Here ends the contiguous 133
meadow steppe, which in its natural state has grasses as tall as a man 137
growing on it. These grasses have brought the steppe the name of "Amur Prairie." This meadow steppe makes way for a magnificent, peculiar forest steppe, in which the hills and high places are covered like islands with oak forests or bushes, while the meadow steppe continues in the lower spots. The dampness of the soil decreases, even though in spots there are often swampy places in the loamy soil. With the further rise toward the north the differences in height become greater, the valley areas become deeper and narrower. Coniferous trees appear on the mountains. The swampiness of the valleys begins to increase again. Slowly the dark taiga takes possession of the entire land, while in the background the rocky peaks of individual gol'tsy already rise from the contiguous greenery.

The significance of the Zeya-Bureya plain is based on the 134
extraordinary fertility of its soil. Tomashevskii (219) has investigated

219. Tomashevskii, I.I. Pochvy iugozapadnoi chasti Zeiskobureinskogo vodorazdela /The Soil of the Southwestern Part of the Zeya-Bureya Watershed/. Works of the Amur Expedition, Vol. XV. Petersburg, 1912.

•134 a large part of this region in this connection. In the southwest soils of intensive black color have developed on the heavy loam. This soil is covered with meadows and pastures with high grass. The black color is the reason that the first explorers put this soil in the category of black earth, and even today this soil is designated still as "chernozem" by the native population. But this is not black earth, for it lacks the granular structure, and also the heaping up of carbonates cannot be determined. During the summer the humus horizon is soaked with water, and in horizon B regeneration processes /245/ /Sketch Map of the Southern Part of Khabarovsk Krai and the Maritime Krai:/1/246/ go forward, which often point to light podsolization. This semi-marshy meadow soil, as Tomashevskii calls it, is, however, not inferior to black earth in fertility and is in a position to produce excellent wheat harvests year after year without any fertilization. As a rule this soil lies in higher places at some distance from the river valley areas, and it covers more than half a million hectares. Somewhat less fertile is a type of soil which is distributed in the deeper depressions and is likewise semi-marshy. This type of soil bears the designation of "miasigi" (kneaded mass /Knetmasse/) among the native population. Here, too, the deep black, upper horizon of soil has developed on heavy loam, but the signs of regeneration are more sharply marked. During the summer dampness horizon B becomes tough, sticky, and viscid like dough, so that, horses sink into the earth and the soil can be worked only with difficulty. In its natural state the "miasigi" is covered predominantly with sedge (Calamagrostis) and moss (Polytrichum) and thus already in its external picture stands [137] out from the relatively drier soils. Brighter podsol soils take up a large part of the Zeya-Bureya plain, especially toward the north and east, with white birches settling by nature on the heavier soils and black birches and oaks on the lighter soils. These trees were already known to the first Russian settlers as indications of the soil. The bleaching out varies gradually and is generally slight. The fertility of this soil is supposed to be equal to that of black earth. Above all this soil can be easily worked since the drainage is better.

During the dry period the Zeya-Bureya plain recalls the black earth steppes of southern Russia. However, during the rainy period the picture changes completely. Flat basins fill up to become lakes, valleys are flooded, and water even remains standing in level areas. Thus Tomashevskii has been very surprised how anyone could ever have arrived at the thought that black earth has formed here. The

1/1 [Cf. Cat. 116, pp. 282-283 - -Analyst]

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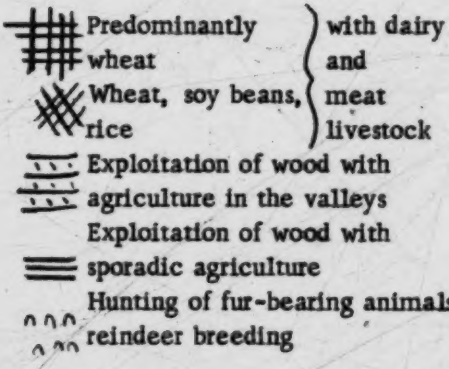
(Captions to Map on page 282)

1. Khor
2. Bikin
3. Lesopil'noye
4. Iman
5. Lesozavodsk
6. Spassk
7. Varfolomeyevka
8. Voroshilov
9. Artem
10. Suchan
11. Kraskino


Predominantly wheat
Wheat, soy beans, rice
with dairy and meat livestock
Exploitation of wood with agriculture in the valleys
Exploitation of wood with sporadic agriculture
Hunting of fur-bearing animals, reindeer breeding

black earth regions in southern Russia have a damp spring and a dry summer. Here it is the reverse: the spring is dry; the summer, on the other hand, is very damp. 134

On the lower Bureya red earth is diffused under lightly podsolized soil. This red earth is the product of the weathering of gray Tertiary slate, and it owes its brick red color to enrichment by iron oxide. This red earth indicates that the climate of the Tertiary period must have been much warmer than it is at present. Also on the lower Amur the same Tertiary red earth has been determined. "Grapes, cork trees, and tigers are vestiges of that time when the red earth was forming, while pines, firs, and reindeers harmonize very well with the present-day formation of soil of the podsol and swamp type," says Glinka (70).

70. Glinka, K.D. O drevnikh protsessakh vyvetrivanniia v Priamurie /On the Old Weathering Processes in the Amur Region/. Pochvovedniie, 1911.

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the Zeya and Bureya. Also the soil both in the Ussuri depression and also in the Khanka lowland is similar to that of the Amur prairies. Here, too, it is not black earth, as is still often reported; rather there is in the main muddy moor soil in the vicinity of the lake; this in turn is surrounded by a broad zone of semi-marshy meadow soil, and following then is weak podsol earth. The last two zones are cultivated almost everywhere, and the soil there can in every respect compare with black earth in terms of its yield. The zone of settlements, therefore, begins to the east and southeast of Khanka Lake but at some distance from the lake. If here, as in the Ussuri region, agriculture has to struggle with difficulties, the reason for this does not lie in the soil but rather in the climatic conditions, above all in the heavy summer rainfall. The winter is very cold and brings only a very thin covering of snow, and thus the ground freezes to great depths. Berg (27) states that at Voroshilov the ground freezes to a depth of up

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27. Berg, L. S., Landshaftno-geograficheskie Zony SSSR /The Landscape-Geographical Zones of the USSR/, (Moscow, 1931), Part I, 1. 372.

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to 1.8 meters and at Grodekovo the frost even penetrates to depths of up to 2.4 meters. The planting of winter grain is, therefore, not advisable, nor is the planting of clover and lucerne advisable. The cultivation of winter crops is, therefore, always a risk. Further toward the south, in the Suyfun depression, winter rye is cultivated without danger. As a consequence of the deep penetration of the frost, the ground thaws out only late in the year. There is, however, no permafrost in the entire Ussuri region. The planting of summer wheat begins in mid-April to May, and the harvest begins in mid-August. Oats are sowed two weeks later, but are harvested at the same time as the wheat. The sowing of millet is done still later; the harvest, however, occurs only in the middle of September. The shortness of the time between the sowing and the maturity indicates the generally favorable conditions for the flourishing of the vegetation. The European types of grain suffer now under the dryness and under the strong winds during the sowing period, while during the summer they suffer from the great dampness, which makes fructification in the blooming period uncertain when it rains and which also endangers the maturing at harvest. All the better do the native cultivated plants /269/ flourish. With appropriate methods of cultivation European